Meeting Notes

A Icy Road Forecast and Alert (IcyRoad): Validation and Refinement Using MDT RWIS Data research project

Project Kickoff Meeting
July 20, 2020, 12:30pm
GoToMeeting

Attendees Present: Jeff Kitsmiller, Page Kelly Piccolo, Doug McBroom, Theresa Bousliman, Matt Strizich, Laura Fay, Justen Juelfs, Bart Bauer, Jennifer Fowler, Menglin Jin, Vaneza Callejas

1. Each attendee was invited to introduce themselves.
2. Vaneza Callejas reviewed MDT research project processes and procedures with an emphasis on communication.
3. Jennifer Fowler led a PowerPoint presentation giving an overview of the project with input from Menglin Jin and Bart Bauer.
    i. Doug McBroom emphasized his interest in data collection and results of the icy road algorithm during the "shoulder seasons" of Fall and Spring when roads surfaces can be warmer in the Fall and colder in the Spring than ambient atmospheric temperatures. He offered to provide additional data from highway cameras.
    ii. Justen Juelfs asked about legality and risk mitigation of UAS data collection flights over moving vehicles. Bart Bauer and Jennifer Fowler answered that it is not legal per FAA regulations to fly over moving vehicles. It is preferred that data collection happens on completely empty road surfaces so no vehicles ever see the UAS even off to the side of the road.
4. Next steps were introduced. An experimental plan is to be drafted by Jennifer Fowler and Bart Bauer for use in the sub-zero laboratory at Montana State University with input from the technical panel and MSU laboratory staff. Dr. Menglin Jin has the data necessary RWIS data to begin analysis for task 1.

Meeting adjourned at 1:10 pm

PowerPoint Presentation:

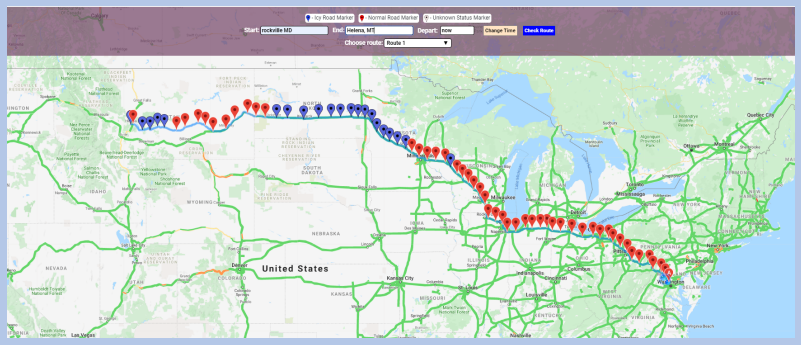
Validation and Refinement Of Icy Road Forecast and Alert (IcyRoad) System Using MDT RWIS Sites

Team

- Principal Investigator: Jennifer Fowler, Director of Autonomous Aerial Systems Office, University of Montana
- CO-Principal Investigator: Steve Running, Ph.D., Regent's Professor Emeritus, University of Montana
- SubContractor: Menglin Jin, SpringGem Weather Information, LLC/University of Maryland
- Technical Staff: Bart Bauer, Chief Pilot Autonomous Aerial Systems Office, University of Montana

Goal

To validate and refine SpringGem Weather Information LLC's current IcyRoad scientific algorithm to detect icy roads in Montana. In particular development under this project will focus on a black ice detection and forecast.



Tasks

Task 1 (refinement):

a. directly analyze MDT RWIS station archived observations to study black ice formation mechanisms for various spatial orographic conditions.

b. compare hourly surface temperature data and icing determination from RWIS, UAS data, and visual on-site inspection with the IcyRoad forecast to identify when and where the accuracy of the forecast is acceptable, and when and where further refinement is needed.

Task 2 (validation):

a. develop baseline observations of spectral signatures on dry, wet, chemically wet, ice, and black ice on asphalt in a controlled environment.

b. Take field observations for comparison with Task 1b (Fall 2020 – Spring 2021).

Key Questions

a) What is the threshold temperature for black ice to form? Previous research found that black ice can form below 32 °F, but sometimes can form slightly above 32 °F.

b) Is a threshold temperature a function of elevation, nearby land cover, road type, climatic history or are there other natural and human activity factors?

c) What is the threshold relative humidity for black ice to form?

d) What is the statistical relationship between an icy road and old snow? Namely, to what percent, does road ice occur when old snow melts during the daytime but re-freezes when the temperature drops?

e) To what percent does black ice occur when there is no precipitation and no old snow? Namely, how frequent is the mechanism of a water source from the outlying atmosphere necessary? What are the conditions for such a case to occur?

f) Are there other mechanisms for black ice formation except for the three identified, namely, pooled, iced, rain water, re-freezing old snow, and ice via condensation?

Objectives

A. Validate IcyRoad forecast using RWIS across Montana for dry, ice, and black-ice conditions.

B. Confirm the use of UAV hyperspectral technology to detect icy road conditions and validate the IcyRoad forecast.

Next Steps – First Quarter

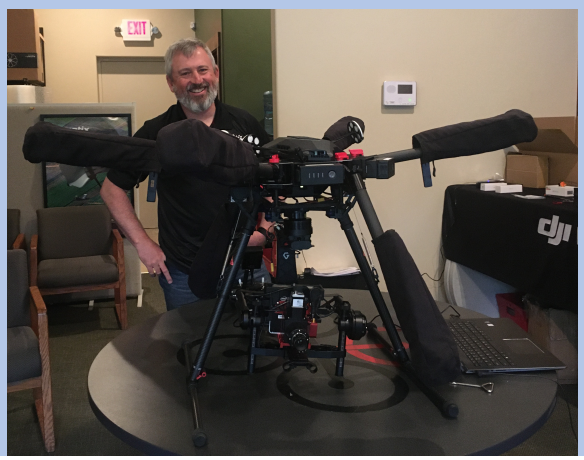
Task 1a

- Dr. Jin will lead Task 1a
- Acquire archive RWIS data
- Consult with and make recommendations for task 2a based on preliminary analysis.

Task 2a

- Fowler and Bauer will be coordinating Task 2a with Resonon and Montana State University Sub-Zero Laboratory
- Design experimental procedure (i.e. determine surface sample, define temperature, humidity, irradiance, and wind speed ranges, mounting of camera, etc.)
- Schedule 5 days for experiment and complete experiment.

Matrice 600 with Hyperspectral Camera



Questions?